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SCIENCE INFORMATION SPECIALIST TRAINING PROGRAM. A PROGRESS REPORT.

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A TRAINING PROGRAM FOR SCIENCE INFORMATION SPECIALISTS, SUPPORTED BY THE NATIONAL LIBRARY OF MEDICINE, PREPARES GRADUATE- LEVEL STUDENTS FOR POSITIONS IN THE BIOMEDICAL INFORMATION AND COMMUNICATION FIELD. EMPHASIZING ADMINISTRATIVE SKILLS, PROFESSIONAL INFORMATION SCIENCE EDUCATION AND EXPERIENCE, KNOWLEDGE OF NONTRADITIONAL SYSTEMS AND INSTRUMENTATION, AND FOREIGN LANGUAGE PROFICIENCY, THIS PROGRAM IS DIVIDED INTO TWO PARTS--(1) A FORMAL PROGRAM AT THE AMERICAN UNIVERSITY LEADING TO THE DEGREES OF MASTER OF ARTS AND DOCTOR OF PHILOSOPHY, AND (2) ON-THE-JOB TRAINING AT THE BIOLOGICAL SCIENCES COMMUNICATION PROJECT (BSCP). DEGREE WORK MAY BE PURSUED IN THE UNIVERSITY'S SCHOOL OF GOVERNMENT AND PUBLIC ADMINISTRATION OR THE SCHOOL OF BUSINESS ADMINISTRATION, WITH A SPECIALITY IN THE TECHNOLOGY OF MANAGEMENT REQUIRED IN EITHER SCHOOL. DEGREE REQUIREMENTS AND DESCRIPTIONS OF REPRESENTATIVE COURSES ARE INCLUDED IN THIS REPORT. ON-THE-JOB TRAINING INVOLVES BSCP PROJECTS RELATED TO ITS RESEARCH PROGRAM IN BIOLOGICAL COMMUNICATION, EXPERIENCE IN AREAS IN WHICH THE TRAINEES WILL EVENTUALLY WORK, FIELD TRIPS, AND CONTACTS WITH EXPERTS IN BIOLOGICAL SCIENCE COMMUNICATION. OTHER INFORMATION INCLUDED IN THIS REPORT ARE PROFILES OF THE FOUR STUDENTS ENROLLED IN THE PROGRAM AND BRIEF SUMMARIES OF THE GRADUATE DEGREE PROGRAMS AND INTERNSHIP PROGRAMS FOR HEALTH SCIENCE INFORMATION SPECIALISTS SUPPORTED BY THE NATIONAL LIBRARY OF MEDICINE EXTRAMURAL PROGRAMS. (JB)

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SCIENCE INFORMATION SPECIALIST TRAINING PROGRAM

A Progress Report

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SCIENCE INFORMATION SPECIALIST TRAINING PROGRAM

A Progress Report

by

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SCIENCE INFORMATION SPECIALIST

TRAINING PROGRAM

I. BACKGROUND

The Biological Sciences Communication Project (BSCP) believes the best attack on the problem of the explosive growth of scientific information is through education and training of science information specialists. Such specialists, trained to keep up-to-date on sources of new information, to develop controls and systems for information flow, to provide research scientists with surveys in their fields of interest are true communication scientists in the research team. To make them most effective, such specialists should have knowledge of: some area of scientific subject matter, information handling, sources of information, and such information services as abstracting, indexing, and translation programs. The communicator's role as a team member may be compared with that of the statistician/mathematician who assists in design of experiments and interpretation of data. As a member of the research complex, he makes available pertinent literature at every developmental stage of a project. A number of industries, universities and research institutes have already established positions for such specialists, but very few have undertaken the kind of training that will yield properly qualified individuals to hold these positions.

It was in this frame of reference that BSCP, early in 1962, submitted to the Division of General Medical Sciences of the National Institutes of Health, a proposal for support of a program to train four graduate-level students to become information specialist administrators in the biological and medical sciences. BSCP was awarded a two-year grant: the first year's program spanned

the period, 3/1/62 to 6/30/63; the second, 7/1/63 to 6/30/64. The training program was in two parts: (1) intensive formal study at the American University in Washington, D.C.; (2) on-the-job training at BSCP. Request for a third year's support was disallowed following newly defined Congressional restrictions on support by NIH of training in scientific communication or documentation. Under the DGMS-supported program (progress reports for which are in NIH files) four individuals received training towards an M.S. or a Ph.D. degree.

In February 1964, BSCP submitted to the National Library of Medicine, (NLM) which had just been designated to grant this type of support, a request for additional support. NLM granted such support and today continues to underwrite BSCP's program of education and training for science information specialists. Other components of the NLM-supported education and training program are described in Appendex I.

II. THE TRAINING PROGRAM

A. General Considerations

1. Methodology

The training program provides a balanced combination of formal course work and in-service activities. We believe firmly that academic training and practical on-the-job experience are both necessary and mutually helpful in a training program for science information specialists.

Under the NLM contract, four applicants interested in future positions in biomedical information and communication are selected.* Each applicant must (1)

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* Trainees were selected by a committee consisting of Drs.:
Foster Mohrhardt
Paul Howerton
Sherman Ross
Charles W. Shilling, Director, BSCP

possess either an M.S. degree in some bioscience, or an M.S. in library science, or a B.S., plus specialized training and experience in bioscience; (2) a desire to work toward the Ph.D. degree.

Successful applicants are awarded an annual salary-stipend of $4,300. Costs of tuition, textbooks, and fees are covered under provisions of the support contract. Each appointment normally is for one year, with renewal subject to review, and will extend until receipt of the appropriate degree.

BSCP professional and administrative staff participate in day-to-day direction of the program, plan the visiting lecturer and field-trip activities, attend to the cooperative direction of the academic program, and direct the in-service activities of trainees.

2. Objectives

The aim of the program is to impart to the participants (1) administrative skills, (2) professional information science education and experience, (3) knowledge of nontraditional systems and instrumentation, and (4) foreign language proficiency. The science information specialist will be expected to synthesize information and background data, and prepare it for presentation at all levels of industry and government. In this endeavor he will perform and apply research to the problems of communication, and will school himself in abstracting, translating, editing, compilation of surveys, and reproduction techniques.

To carry out his functions most effectively and to equip himself for all the complexities of modern governmental and business operations, the trainee will need strong grounding in the technology of administration and management. Thus, he will be instructed in various managerial areas that have attained contemporary significance, such as operations research, scientific and technical information systems, and management information systems.

In the past decade, business and government have experienced technological developments whose revolutionary impact continues to grow. New instruments and

techniques for handling masses of information have precipitated a major managerial upheaval. Mastery of these information and management refinements now requires the highest level of academic and professional sophistication. In view of these facts, the BSCP training program for these specialists seeks to create not mere technicians but academicians and technical managers with a grasp of the full scope of the institutional complex.

B. Formal Training

1. Course Requirements

Trainees will undertake a formal graduate-level program of studies at the American University leading to the degrees of Master of Arts and Doctor of Philosophy. Enrolled in the University's Center for Technology and Administration, the trainee may pursue his degree work at one of two schools embraced by the Center. Depending on his interests, he may choose the School of Government and Public Administration, if his concerns are the governmental perspectives of information, administration, and management; or the School of Business Administration, if he prefers to study these areas in a business administration frame of reference. In either case, his speciality is the Technology of Management, which comprehends a broad spectrum of the systems characteristic of contemporary and future information and managerial methods and institutions.

Although the core programs and the degrees granted are those offered by American University, if a need is manifested and circumstances permit, trainees may enroll for a specific course which is not offered at American University, at one of the four other institutions making up the consortium of universities in the Washington, D.C. area: Catholic University, Georgetown University, George Washington University, and Howard University.

The following outline presents minimum requirements for trainees registered for M.A. and Ph.D. degrees at American University. It must not be assumed that upon completing these requirements, a degree is automatically awarded. Each

individual brings to the program his own record, which must be evaluated by American University's Graduate Council. That evaluation determines what the actual semester hour requirements will be for a specific degree.

Minimum Requirements for Master's Degree

Credit hours of graduate course work (minimum total)..... 30

Credit hours as residence requirement at American University..... 24
(These include thesis or non-thesis option)

Credit hours allowed at other institutions..... 6

Credit hours applicable toward in-service project..... 12
(The in-service project will be an individual research endeavor undertaken by the trainee working on a specific BSCP project. The work will be supervised jointly by a member of the faculty and an official of BSCP.)

Credit hours applicable toward thesis seminar..... 6
(or six semester hours in approved 600 or 700 level research seminars, with a grade of B or better for research in each seminar.)

Comprehensive examinations with at least 1 written examination
(to be determined by need and interest of trainee and objectives of BSCP)

Thesis will be chosen in a field pertinent to the objectives of BSCP.

Minimum Requirements for Doctor's Degree

Credit hours of graduate course work (minimum total).....72

Credit hours as residence requirement at American University
With Master's from American University.....30
With Master's obtained elsewhere.....42

Credit hours applicable toward in-service project.....12
(see comment for Master's degree)

Credit hours applicable toward thesis seminar..... 6
(to be taken concurrently with work on dissertation)

Research tool - Proficiency in two foreign languages (German, French, Russian, or Spanish) with other languages upon special request; or one language and statistics.

Comprehensive examination in four fields.
(Two examinations must be written. Fields determined by needs and interests of trainee and objectives of BSCP.) (One examination required in general area of Science, Technology, and Government.)

Dissertation is required of all Ph.D. candidates.
(To be chosen in a field pertinent to BSCP objectives)

Oral examination will cover dissertation itself and the general field in which it lies.

Courses taken by degree candidates are grouped under several listings referred to as "Comprehensive Examination Fields." Two of the groups, "Science, Technology and Government" and "Management Administrative Establishment" are required of all trainees. Those enrolled in the School of Business Administration must, in addition, take courses in groups designated "Business Management: and "Managerial Analysis (Business Economics);" those in the School of Government and Public Administration take courses in any two additional areas. In addition to these requirements, all trainees must take a course entitled "Graduate Survey of American Government."

Course Descriptions

The several comprehensive fields, plus descriptions of representative courses within each field, are given below:

1. Scientific and Technical Information System

TYPES AND USES OF SCIENTIFIC AND TECHNICAL INFORMATION. Analytical study of the total process of, and requirements for, the effective communication of scientist-user. The types of purpose and system requirement: Institutional records; scientific, technical, and research reference; archives. Operational specifications as they derive from the end-use of the system, and their implications for original documentation, media, acquisition, abstracting, indexing, searching, and other subprocesses.

TECHNICAL INFORMATION MACHINE SYSTEMS. The application of machine systems with major emphasis on the handling of technical literature and data. The analysis of the individual user requirement. The capabilities of mechanized systems, both simple and sophisticated, their applicabilities, feasibilities, and optimums of design in relation to user requirements.

CONCEPTS OF INDEXING AND ABSTRACTING. An intensive specializing course in the control processes of indexing and abstracting. The taxonomy of information organization, identification and storage. Topical structure and designation. Methods

of reducing content of technical writings to abstract length without losing essential information. Workshop experience and case review.

2. Computer Systems

AUTOMATIC DATA PROCESSING SYSTEMS. A survey of the systems aspect of ADP. Computer organization and equipment operation; concept of programming; data processing equipment; information and data systems; systems analysis; equipment acquisition and utilization; data communication systems.

COMPUTER DESIGN. Boolean algebra, application of Boolean algebra to switching elements, control, arithmetic units and converters, error detection and correction, logic of storage elements and sequential circuits, finite automata, Turing machine.

COMPUTER PROGRAMMING. Components of electronic digital computers, number systems, computer words, instructions, address, logic, codes, subroutines, problem analysis, scaled operations, flow diagrams, code checking, problem checking.

WORKSHIPS IN COMPUTER SYSTEMS. Higher-level languages, procedure-oriented languages, FORTRAN, COBOL, PL-1; multi-processing, multi-programming; simulation languages; data-transfer systems.

3. Management Information Systems

SYSTEMS DESIGN FOR BUSINESS OPERATIONS. Mechanization and automation of office operations. A practical course in the capabilities, applications, and design and use of systems for handling administrative data, cases, and processes. Punchcard machines; electronic computers.

MANAGEMENT OF AUTOMATIC DATA-PROCESSING SYSTEMS. Whether the use is technical information, administrative operations, or management information, the machine system itself has to be planned, installed, and run. This course concerns: estimate of requirements; planning the total system; conversion problems; costs and performance evaluation; the executive role in achievement of integration.

MANAGEMENT INFORMATION AND REPORTING SYSTEMS. The decision maker's information requirement. Related system performance requirements. Design and installation of the responsive system. PERT, CPM, and similar planning and control information systems. Problems and techniques of executive use of the system product. Interaction and integration of information-processing systems and institutional records systems. Workshop in the design and installation of actual and model systems.

4. Research and Development Management

MANAGEMENT OF RESEARCH AND ENGINEERING ORGANIZATIONS AND LABORATORIES. The basic course on the internal management of the research performance organization. The full spectrum of the elements of effective management as they apply in such organization. Comparisons of general management practices in government and business, with the situation of the research organization.

CREATIVITY AND INVENTION. An interdisciplinary social science course directed to the understanding of creativity and invention, and of the determinants of their occurrence and quality in persons and groups. The approach will combine scientific-historical case study with review of contemporary behavioral science. The practical purpose is to sensitize the R&D manager to this requisite of his organization and purpose, and to help him articulate managerial tools and policies for its maximization.

POLITICS AND ECONOMICS OF RESEARCH AND DEVELOPMENT. The magnitude, characteristics, and politico-economic significance of the R&D economy of the U.S. compared to other countries. The structure and nature of the U.S. research industry. The government-business defense economy. Government non military research. Business and industrial research. Trends and forecasts. National resources allocation, and other political and economic problems.

SEMINAR IN R&D MANAGEMENT. Scientific and engineering personnel. Case problems are studied to determine elements of effective personnel administration as they

apply or differ in an organizational population of scientists and engineers.

SEMINAR IN R&D MANAGEMENT. Planning and control of research operation. Operational policies and goals. Forecasting, planning, programming, financing, and scheduling. Marketing and customer relations. Review, control, and evaluation of research performance. Application of systems analysis in research evaluation and control.

5. Science, Technology and Government

SCIENCE AND THE STATE. Interactions of science, scientists, and government, and their political, administrative, and social implications. Problems of public policy in scientific subjects. Roles and obligations of scientists toward and in public policy and administration. Politico-economic implications of governmental scientific research. Implications of science for the traditional state system and international order.

CYBERNETICS AND SOCIETY. The phenomenon of cybernation, in its most comprehensive totality, may be the most fundamentally significant social and philosophical problem of the next half century. This course will consider the threats and promises in the widest array of dimensions: automation and the labor force; the formidable implications of computer-amplification of the potentials of scientific research. Soviet concepts and achievements in the cybernation of bio-social research, social planning, and societal control. Issues for the U.S. citizen, the U.S. social scientist, and the U.S. government.

SEMINARS. Research seminar; general seminars; doctoral dissertation seminar.

6. Management of the Governmental Administrative Establishment

MODERN PUBLIC MANAGEMENT. Perspectives, problems, and processes of the executive function of directing the managerial-administrative organization, including the major characteristics and roles of the spectrum of management sub-functions which it must depend on and integrate. Main lines of the behavioral and organ-

izational theory of the managerial organization and the management function.

BEHAVIORAL SCIENCES IN PUBLIC MANAGEMENT. Psychological and social concepts and theories of the characteristics, attitudes, behaviors, and relationships. Managerial understanding of organizational behavior.

ANALYSIS OF GOVERNMENTAL ORGANIZATION AND OPERATION. Evaluation and diagnosis of governmental administrative organization, performance, and productivity. Design and installation of systems and procedure.

7. Business Management

PRINCIPLES OF MANAGEMENT. Theories of management. Managerial functions: planning, organizing, coordinating, motivating. Budgeting. Decision making. Communication, human relations.

ADMINISTRATIVE COMMUNICATION. Fundamentals of: (1) organizational communication, including organizing of channels, systems, patterns, and (2) interpersonal communication, as developed by general semantics and the behavioral sciences.

DESIGN OF ORGANIZATIONS. Developing structures that effectively organize all resources necessary to achieve organizational objectives. Analysis from viewpoint of authority, response, communication systems, compensation, technology.

SEMINAR IN PHILOSOPHY OF MANAGEMENT. Fundamental concepts of management: analysis of interrelations, relation to administrative process. Development of organizational and individual philosophy.

8. Managerial Analysis (Business Economics)

INTRODUCTION TO MANAGERIAL ECONOMICS. Emphasis on areas most useful to business executives. The economy: its indicators, measures, fluctuations.

FOUNDATIONS OF BUSINESS FORECASTING. Tools needed by executives to evaluate appraisals of economic outlook in decision making.

MANAGERIAL ANALYSIS. Integration of economic, organizational, motivational,

legal, ethical and other managerial aspects in solving national and international business problems.

9. Operations Research

OPERATIONS RESEARCH IN MANAGEMENT. How operations research supports management; decision theory approach; applied decision theory; introduction to basic operations research models and problems.

PROBABILITY AND STATISTICS FOR MANAGEMENT DECISIONS. Decision under uncertainty; cost of uncertainty; probability distributions; conditional models; Bayesian approach; sequential decision procedures; hypothetical testing; estimation.

METHODS OF OPERATIONS RESEARCH. Sampling; inventory problems; replacement problems; linear programming; sequencing; dynamic programming.

C. On-The-Job-Training

On-the-job activities are provided by BSCP, whose Washington, D.C. location, diversified research program in biological communication, and close cooperation with organizations and specialists in the communication field make it well equipped to conduct the laboratory phase of this training program.

Trainees are under supervision of the Director, Dr. Charles W. Shilling, who serves also as counselor for the core program and its various activities. Along with expert guidance from the staff, trainees enjoy such readily available facilities as the biological science library at BSCP headquarters and the hardware normally associated with a science information center. Rich and varied experience is available from participation in BSCP's many projects involving analysis and evaluation of science literature and information sources and preparation of information for transmittal from producer to consumer. Typical projects in which trainees might participate include: development of a serial record center, study of the availability of serial literature for developing nations, study of the relevance of titles in describing the content of biological science articles,

investigation into the processes of information transmittal from scientist to scientist, and analysis of non technical literature of primary importance to the biologist.

In addition to BSCP activities, trainees receive essential experience in areas in which they may need to perform during their future careers. Such areas include preparing a hand-produced permuted index (both KWIC and KWOC) for a scientific journal, developing a selected bibliography for a special scientific subject, constructing a citation index in a narrow field of scientific specialization, writing proposals and reports of research. Some of these activities may carry graduate course credit or may be used in connection with a doctoral dissertation.

Field trips are made to nearby libraries, research centers, and communication agencies, where trainees may keep abreast of their various activities. The Washington area offers splendid opportunities for experience with specialized forms of publication (microfilm, microcard, etc.) and in operation of necessary equipment (computers, photocopy machines, etc.). Government and private agencies accessible to trainees include: National Library of Medicine, National Agricultural Library, Library of Congress, U.S. Book Exchange, Biological Abstracts (Philadelphia), Science Information Exchange, Defense Documentation Center, Clearing House for Scientific and Technical Information, American Society for Information Science, American Chemical Society, etc.

BSCP, through its wide-ranging, cooperative associations with many prominent scientists, provides trainees with opportunities to talk with experts in biological communication. Professional meetings, symposia, institutes, and conferences held in the Washington area furnish additional scope for personal contacts. Trainees attend meetings, selected for their relevance to the students particular interests.

By providing first-hand experience in the problems and tools of scientific communication, this on-the-job activity seeks to enhance the meaningfulness of the total training venture.

D. Current Activity - 1967-68

Under the grant from the National Library of Medicine, four graduate students are working on BSCP information-processing projects, while registered for the doctoral degree at American University. Bibliographies, reports, and studies emanating from the students' activities are expected to benefit the scientific community, while furthering the careers of these workers. Three of the students have been with the current program since its inception in February 1966, one entered in September 1966. The following profiles with background, academic course work, on-the-job projects, and plans for the future should provide insight into the nature and quality of the BSCP training program.

Student A has a Bachelor of Fine Arts degree from Ithaca College, with a major in music and psychology, and a Master of Science in Library Science from Syracuse University. From February 1965 to June 1965, she held a graduate assistantship at the Graduate School of Library Science of Syracuse University. Her fields of concentration as a Ph.D. candidate are: Scientific and Technical Information Systems; Computer Systems; Management of the overnment Administrative Establishment; and Science, Technology and Government. Her dissertation topic deals with the language of information science and the construction of an authority file to embrace generic and specific levels within this field.

This student's initial in-service activity was indexing a corpus of information science/documentation literature. In another assignment, she assisted in the design and processing of a study of the National Library of Medicine's inter-library loan service. She is now engaged in surveying and analyzing vocabularies, glossaries, and word lists dealing with information science/documentation terms. She plans in future to continue with research in design and implementation of small information systems, development of authority files, and the language of information.

Student B has a Bachelor of Arts in chemistry from Clark University, Worcester, Massachusetts, and a Master's degree from American University. As an undergraduate, he worked one summer coding chemical compounds in the technical records section of Lederle Laboratory. For three years before coming to BSCP, he worked on processing spectral data in the analytical instruments section of the Worcester Foundation for Experimental Biology.

This student's comprehensive fields for the master's degree were Computer Systems and Management of Governmental Administrative Establishments. These two fields plus Scientific and Technical Information, and Science, Technology, and Government are his doctoral concentration areas. His dissertation will focus on specialized information centers.

He has been involved with collected material on the design and operation of specialized information centers, and with the computer-processing aspects of the National Library of Medicine's interlibrary loan study. Upon completion of the program, he plans to return to the Worcester Foundation for Experimental Biology to establish and manage a proposed information center.

Student C has a Bachelor of Science in chemistry from the Carnegie-Mellon University (formerly Carnegie Institute of Technology) and, while under the training grant, has completed the Master of Arts in Public Administration: Technology of Management from American University. Her special fields in the Masters program were Scientific and Technical Information systems and Computer Systems. In the doctoral program her fields are Scientific and Technical Information Systems; Computer Systems; Management of Governmental Establishments; and Science, Technology and Government. Her dissertation will deal with education and training activities of information scientists.

Before entering the training program, this student worked as a chemist for Melpar, Inc. and for the National Bureau of Standards. Her duties at the

Bureau included abstracting, indexing, bibliography preparation, and maintenance of a small information system. She authored five Bureau of Standards Technical Reports. At BSCP, this student has been concerned with the education and training of information scientists. She has collected and maintained a large file on courses, curricula and textual materials for information science programs in the United States. She is the author of three BSCP publications. The first report, Education and Training of Information Specialists in the U.S.A. provides a detailed description of graduate degree programs in Information Science presently offered in the United States. Graduate credit has been given to the student by the American University for the research done for this report. The second publication, Survey of Practical Training in Information Science presents a survey of all types of on-the-job training programs currently being conducted in universities and industrial organizations. The most recent report, Survey of Texts and Instructional Materials Used in Information Science Programs, presents a bibliography of books, and other texual materials currently being used in the university programs.

After completion of her degree, she tentatively plans to maintain an active interest in educational activities, working either in the government or for a university.

Student D has a Bachelor of Science in chemistry from Merrimack College, North Andover, Massachusetts and a Master of Science in biochemistry from the University of New Hampshire. While at New Hampshire, he was a Graduate Teaching Assistant in the Biochemistry Department. His comprehensive fields in the doctoral program at American University are: Scientific and Technical Information Systems; Science, Technology and Government; Science Sources-Biochemistry and Computer Systems.

Before embarking on the training program, this student worked as an in-

formation specialist at Battelle Memorial Institute, Columbus, Ohio where he was initially assigned to the Radiation Effects Information Center and the Information Research Center. He was later responsible for establishing an ecological data base for use by scientists investigating the proposed sea-level canal in Panama. In his first project at BSCP he began a survey of informal communication in biochemistry by examining the Information Exchange Groups, an experiment in quick communication sponsored by the National Institutes of Health. Currently, he is collecting information on books and monographs in biochemistry and preparing a critical abstract of each work. He is expanding his work on informal communication and the Information Exchange mechanism for use as a dissertation topic. His plans for the future are centering on two areas: mechanisms of informal communication among scientists and administration of research in information science.

III. APPENDIX

This section provides a brief review* of both the Graduate Degree Programs, and the Internship Programs for health science information specialists**. These training programs are supported by the National Library of Medicine Extramural Programs.

The graduate degree programs with the sponsoring institution and the program director are as follows:

Institution	Program Director
School of Library Science University of California 326 College Library Los Angeles, California 90024	Robert M. Hayes, Ph.D.
Library School University of Minnesota Minneapolis, Minnesota 55455	Wesley Simonton, Ph.D.
Graduate Library School University of Chicago Chicago, Illinois 60637	Don R. Swanson, Ph.D.
School of Library Science Western Reserve University Cleveland, Ohio 44106	Alan M. Rees
Graduate School of Library Science University of Illinois Urbana, Illinois 61801	Frances B. Jenkins, Ph.D.
George Washington University Room 700 2000 P. Street N.W. Washington, D.C. 20036	Charles W. Shilling, M.D.
School of Medicine Tulane University New Orleans, Louisiana 70112	Walter G. Unglaub, M.D.

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*All material furnished by the program directors

**Health Information Specialists include medical librarians, health information scientists, discipline-oriented information specialists, etc.

The Internship Programs are as follows:

Institution	Program Director
Washington University School of Medicine 4580 Scott Avenue St. Louis, Missouri 63110	Estelle Brodman, Ph.D.
Medical Library School of Medicine Center for the Health Sciences University of California Los Angeles, California 90024	Miss Louise Darling
The University of Tennessee College of Pharmacy 62 South Dunlap Memphis, Tennessee 38103	Andrew Lasslo, Ph.D.
Welch Medical Library School of Medicine Johns Hopkins University Baltimore, Maryland 21205	Alfred N. Brandon
Medical Library College of Medicine Wayne State University 645 Mullett St. Detroit, Michigan 48226	Vern M. Pings, Ph.D.

SUMMARY OF EACH PROGRAM*

GRADUATE DEGREE PROGRAMS

SCHOOL OF LIBBARY SERVICE, UNIVERSITY OF CALIFORNIA, LOS ANGELES

Offers a curriculum leading to a degree of Master of Science in Information Science (Documentation), combining course work in the mathematics of system design and evaluation, in methods for library-based information service, in the management of libraries and other information activities, and in computer application to information handling. The program requires eighteen calendar months (six academic quarters), usually completed in two academic years. It requires that the student engage in independent study resulting in a thesis, in addition to taking the prescribed courses.

Admission Requirements. Applicants for admission to the degree program must satisfy the requirements for graduate study at the University of California (generally represented by a bachelor's degree from an accredited college or university, with an undergraduate record equivalent to a B average). In addition, they must have completed at least two quarters of the calculus and have scored an acceptable grade on the Graduate Record Exam.

Support by NLM. Five stipends of $2,400 each (plus additional funds for dependents) are provided by NLM for support of students in their first academic year (nine months) of the program. These are renewable for the final year if satisfactory progress is demonstrated. Applicants for NLM stipends are judged competitively. Generally, they must have the equivalent of a B+ average in prior work and an expressed interest for bio-medical information systems work.

Further Information. Write to Professor Robert M. Hayes, Program Director, School of Library Service, University of California, Los Angeles, California 90024.

LIBRARY SCHOOL AND CENTER FOR DOCUMENTATION AND INFORMATION RETRIEVAL, UNIVERSITY OF MINNESOTA, MINNEAPOLIS

Offers a biomedical librarian training program to prepare librarians and information specialists conversant with and capable of handling the expanding activities of biomedical libraries and information centers, focussing on the intelligent use of new information storage and retrieval techniques and the design of such techniques and systems.

Trainees will be enrolled in the Library School and will receive an M.A. degree with a major in library science upon completion of the program. Detailed information on the M.A. degree program in general is available in the Library School Bulletin which will be sent upon request.

*Detailed information may be obtained from the program directors.

In connection with the academic work in the Library School, Trainees will be involved in research activities in the Bio-Medical Library of the University and in the Information Retrieval Research Project in the field of diabetes-related literature, under the direction of Dr. Arnold Lazarow of the Anatomy Department.

Qualifications. Applicants for the program must meet the entrance requirements of the Graduate School of the University, including a bachelor's degree and a grade point average of B plus. Preference will be given to individuals with a background in the bio-medical sciences. The fellowships are open only to U.S. citizens or to non-residents lawfully admitted for permanent residence.

Support by NLM. The fellowships are for full-time study during a twelve month period, beginning in Fall Session, 1967. In addition to free tuition, fellows receive a tax-free stipend at the level established for Public Health Service fellows (presently $200 per month) plus a dependency allowance if appropriate. A limited number of post-doctoral grants are also available, with stipends as established by the Public Health Service.

Further Information. Inquiries concerning the grants and requests for application forms and Library School Bulletins should be addressed to Professor Wesley Simonton, Library School, University of Minnesota, Minneapolis, Minnesota 55455.

GRADUATE LIBRARY SCHOOL, UNIVERSITY OF CHICAGO

Offers approximately eight traineeships in medical librarianship annually. The normal M.A. degree program within the School is followed except that three of the eight courses which are normally elective are required to be in the medical librarianship field. The student is also expected to write an M.A. thesis in that field. A variety of courses within information science and library science is offered, as outlined in the School's Announcements. Emphasis is placed on the planning of future libraries and upon national requirements for biomedical information systems. The students are also offered the opportunity to participate on a number of research projects centered upon an experimental information service which the Graduate Library School provides to faculty members of the University of Chicago School of Medicine.

Requirements. Applicants to the School must have a bachelor's degree or equivalent, and are judged for admission on a competitive basis with respect to their academic record, statement of purposes, letters of reference, and performance on the Graduate Record Examination.

Further Information. For further information and application forms, contact: Office of the Dean, Graduate Library School, University of Chicago, 1116 East 59th Street, Chicago, Illinois 60637.

SCHOOL OF LIBRARY SCIENCE, CASE WESTERN RESERVE UNIVERSITY, CLEVELAND, OHIO

Offers a one-year Training Program in Medical Librarianship leading to the

M.S.L.S. degree and qualifying graduates for certification by the Medical Library Association. The Program includes a sequence of three special courses totaling 9 of the 36 credit hours required for the degree, a four-week period of field work immediately following the Summer Session of classes, and a series of special seminars and field trips (including the annual MLA meeting) during the academic year.

Admission Requirements. All students in the Program must meet the admission requirements of the School of Library Science, and applicants wishing to be considered for Stipend awards must complete both their Library School application and a special Stipend application by April 1, 1968. All full-time students must enter in June.

Support by NLM. A limited number of Stipend awards are made each year (6 for 1967-68, 7 for 1968-69), through the Extramural Program of the National Library of Medicine. Recipients of full Stipends receive $2,400 per year plus remission of tuition and fees, as well as an allowance of $500 for each legal dependent. These awards are open to all U.S. citizens and to permanent residents of the United States.

Applications and Further Information. Write to Mr. Alan M. Rees, Director, Training Program in Medical Librarianship, Case Western Reserve University, 10831 Magnolia Drive, Cleveland, Ohio 44106.

UNIVERSITY OF ILLINOIS GRADUATY SCHOOL OF LIBRARY SCIENCE, URBANA

Offers ten fellowships annually to students training to become biomedical librarians. Students enroll each June in a 14-month program leading to a Master of Science degree in librarianship.

Program. First summer: four required basic courses in librarianship. Fall semester: graduate courses in literature of science and technology, library administration, advanced cataloging, and science reference service. Spring semester: graduate courses in government documents, bibliography of biological sciences, and information storage and retrieval; and a practicum as a bibliographic assistant on a biological sciences research project. Second summer: graduate courses in medical literature and reference work, and computer-based systems for libraries. (One relevant graduate-level science course may be substituted for one of the other courses.)

Stipend. $2,800 for the 14 months, plus $584 allowance per dependent.

Requirements. Bachelor's degree; at least 12 semester hours in the biological sciences; a grade point average of at least 3.75 (on a 5.0 scale) for the last 60 hours of coursework.

Application and Further Information. Professor Frances B. Jenkins, Graduate School of Library Science, University of Illinois, Urbana, 61801.

THE SCHOOL OF MEDICINE, TULANE UNIVERSITY

Offers a graduate program in biomedical communication which is now being offered by a consortium consisting of the School of Medicine, the School of Public Health and the Graduate School of Business Administration of Tulane University, the School of Medicine, Emory Unviersity, the School of Information Science, Georgia Institute of Technology, the Schools of Medicine and Journalism, University of Nebraska, the National medical Audiovisual Center of the Public Health Service and the National Library of Medicine.

In this one-year program time is divided among the participating institutions in New orleans, Atlanta, Omaha and Washington, D. C. Subject matter covered includes: The Biomedical Community, Group Dynamics and Educational Psychology, Computer Organization and Programming, Program Management and Systems Concepts, Communications and Control of Scientific Information, Research Methods, Technology of Communication Equipment, Communication Tools in Action, Medicine and Health Today and Tomorrow, Biomedical Writing and Editing, Practical Applications of Television in Biomedical Communication, The Library and Biomedical Communication, and Science and Public Policy.

Completion of a project or thesis appropriate to the field is required, as is successful oral defense of the thesis or project. Upon satisfactory completion of the program, the degree of Master of Medical Science in Biomedical Communication is awarded by Tulane University.

Enrollment and Stipends. Enrollment is limited to a maximum of ten persons. Stipends providing tuition, fees, travel and subsistence, with dependency allowances, are available for a maximum of four candidates holding doctoral degrees. Non-doctoral candidates who can provide their own support from other sourrces will be accepted up to the enrollment limit.

Admission Requirements. Applicants must be: 1) A graduate of an acceptable school of medicine, dentistry, veterinary medicine or nursing. Graduates in nursing must have obtained a college degree and have had at least two years of experience in a specialized area of nursing satisfactory to the Committee of Admissions, 2) A graduate of other doctoral programs in biomedical specialty areas, edication or the behavioral sciences, 3) In exceptional circumstances, the Committee on Admissions may admit unusually well qualified applicants who a) have completed at least one academic year of study in arts or sciences basic to health and/or communication and who b) have had a period of acceptable experience in a responsible position in health and/or communications.

Applications and Further Information. Write to Dr. Walter G. Unglaub, Program Director, Graduate Program in Biomedical Communication, 1430 Tulane Avenue, New Orleans, Louisiana 70112.

INTERNSHIP PROGRAMS

WASHINGTON UNIVERSITY SCHOOL OF MEDICINE LIBRARY, ST. LOUIS, MO.

Trains four librarians each year in the use of computers in libraries. The program runs for one year, from September 1 to August 31. The training program includes (1) formal courses in computer technology, the biomedical sciences, linguistics, and user psychology, depending upon the trainee's own interests, (2) individual work with scientists and practitioners, during which the trainee acts as bibliographical assistant and general handyman, (3) experience in the Library's own experimental Machine Project, and (4) individual experimental work, hopefully leading to publication.

Admission Requirements. Applicants must have a bachelor's degree from a recognized college, preferably with a major in the biomedical sciences, mathematics, psychology, or linguistics, and a master's in librarianship or information science.

Applications and Further Information. Write to Dr. Estelle Brodman, Librarian and Professor of Medical History, Washington University School of Medicine, 4580 Scott Ave., St. Louis, Mo. 63110.

BIOMEDICAL LIBRARY, UNIVERSITY OF CALIFORNIA, LOS ANGELES

Offers four one-year internships annually. Time is divided between planned training in medical librarianship and formal course work selected from: biological sciences, history of medicine, information science, and foreign languages, depending upon the academic background and interests of the trainees. Work assignments are made on a rotating basis in the Library's Divisions and for shorter periods in the UCLA MEDLARS Search Station, the Brain Information Service, and the Technical Processes Automation Project. These are supplemented by readings, discussions with staff members, visits to other libraries and attendance at professional meetings.

Admission Requirements. Candidates must hold a master's degree from an accredited library school, have a working knowledge of at least one foreign language, and a minimum of 15 units in the natural or behavioral sciences.

Applications and Further Information. Write to Miss Louise Darling, Program Director, Librarian, Biomedical Library, University of California, Center for the Health Sciences, Los Angeles, California 90024.

POST-GRADUATE TRAINING PROGRAM FOR SCIENCE LIBRARIANS, UNIVERSITY OF TENNESSEE MEDICAL UNITS

The Post-Graduate Training Program for Science Librarians at the University of Tennessee Medical Units will commence its third year July 1, 1968. For information about those who have completed the Training Program, or are currently in residence, the reader is referred to the October 1967 issue of the

Bulletin of the Medical Library Association (55(4): 513, 1967); the list is expected to be up-dated in subsequent issues of the Bulletin.

Within the framework of the Training Program, graduates in library scinece (M.S. or M.A.) are assigned to research teams of competent scientists, and serve as liaisons between investigators at the laboratory bench and pertinent resources of already published information. The librarian is housed in one of the reseach laboratories within the jurisdiction of the respective scientist. The trainee is provided with conference time in which research design, prospective and retrospective data analysis and presentation are considered, including discussions of contemporary philosophy in scientific research. The trainee is guided by his research scientist colleagues into assisting with two general aspects of library and information use: (a) exhaustive bibliographic treatment of specific areas of research, and (b) exploration, evaluation and development of procedures for literature search as well as for information storage and retrieval suited for the day to day operation of the research laboratory, utilizing up-to-date tools and methodology; including access to University operated transistorized digital computers. Through close collaboration with his co-workers the trainee is expected to become an integral member of the working research team, at once stimulating and in turn being stimulated by his scientist colleagues, gaining thorough understanding of the scientist's needs in terms of library service.

Further Information. Wrtie to Dr. Andrew Lasslo, Professor and Chairman, Department of Medicinal Chemistry, College of Pharmacy, University of Tennessee Medical Units, Memphis.

WELCH MEDICAL LIBRARY, JOHNS HOPKINS UNIVERSITY

Offers training for four graduate librarians in the subspecialties of biomedical librarianship, in a 1-year intensified program which begins either on July 1 or September 1. The subspecialties are: (1) public services, (2) administration, (3) technical services, and (4) history of medicine librarianship. It includes tuition-free academic courses, supervised work experience, and a 2-month special research project selected by the trainee and his advisor. Application forms accepted until May 1 for July and July 1 for September.

Applications and Further Information. Write to Mr. Alfred N. Brandon, Director and Librarian, Welch Medical Library, Johns Hopkins University, 1900 East Monument Street, Baltimore, Md. 21205.

THE WAYNE STATE UNIVERSITY MEDICAL LIBRARY, DETROIT

Is continuing its post-Masters fellowship program in medical librarianship. Major emphasis is on the development of skills and attitudes for investigative work in biomedical librarianship and acquiring competence in the technical operation of biomedical libraries as exemplified by the Detroit medical library network. The Fellow will also be expected to learn about the organization of the biomedical scholarly record through formal study and working with students, faculty, research workers and practicing physicians. The program is designed

to permit a variety of experiences by

1) Participating in the work of all the departments of the medical library and in some service units of the Detroit medical library network; the objective is to gain sufficient experience to provide the Fellow with the opportunity to evaluate and judge the importance and efficiency of each of the library departments,

2) Attending seminars in the School of Medicine and, at the election of the Fellow, taking formal course work at Wayne State University, The University of Michigan, or other institutions which will provide additional background for medical librarianship,

3) Participating in the investigative work now in progress at the Medical Library, and

4) Attending professional library meetings and workships on specific biomedical communication problems as well as planned visits to the National Library of Medicine and other biomedical resource libraries.

Location and Facilities. The School of Medicine and the Library are located in downtown Detroit. Construction is underway to move the School of Medicine to a new location in the near north side. The move will be effected in 1970.

Stipend - $5500. The Fellowship carries a twelve month stipend of $5500, of which the first $3600 is tax free. A $500 allowance is also available for each dependent.

Admission Requirements. The Fellow, to qualify for this program, must be a United States citizen or resident and graduated from a library school within the past two years. A bio-science background is not a major consideration in making appointments; the most important requirement is a demonstration by the applicant of an interest in medical librarianship as a career.

Application. Applications will be accepted through 1 May 1968 for appointments made in July through September. For application forms and additional information write to Vern M. Pings, Ph.D., Librarian and Professor, School of Medicine Library, 645 Mullett St., Detroit, Mich. 48226.